FLAT RATE VERSUS METERS[1]

By C. E. Abbott[2]

There has always been some controversy as to the relative merits of conducting water works systems on a flat-rate basis and an all-meter basis with conditions otherwise the same, and as to whether the benefits to be derived warrant the installation of the all-meter system. The owners and operators are practically unanimously in support of the meter system, while the consumers uniformly contend for the flat-rate basis; and this fact alone tends to show upon whose side the benefits of the meter system lie.

Of course, no criterion can be established for the entire country from statistics gathered in any one locality and, furthermore it would be foolish for any one man to undertake from his own experience to prescribe the best operating methods for localities other than his own and operating under conditions with which he is not familiar. The author has been manager of the Water Works System at Tuscaloosa, Alabama, for about eight years. During this time the plant there has been operated first upon a flat-rate basis and later upon a practically all-meter basis, and he is, therefore, in a position to give facts and figures, by a comparison of which the many advantages of the meter system can be easily seen. However, he certainly does not wish to be regarded in the light of trying to tell other managers and superintendents how to run their business, or to insinuate that he knows it all, or any more than any one else. But, having operated his plant under both systems and had opportunity to observe carefully the results of both operations, it has occurred to him that probably the figures covering these operations might be of interest to other operators who perhaps at this time find themselves under conditions similar to those at Tuscaloosa when the change from the flat-rate basis to the meter basis was contemplated.

[1] Read before the annual convention at Buffalo, June 13, 1919. Discussion of this paper is requested, and should be sent to the Editor.

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There are many advantages of the meter system over the flat-rate system that need no comparison to establish their validity One of the foremost of these is the great injustice to the consumers themselves in the flat-rate system. Upon this slack basis one consumer may pay a stipulated amount for his water—based probably upon the number of openings—and probably use 5000 cubic feet of water within a given time; while another consumer with the same number of openings and paying the same basic amount for his water could use 10,000 cubic feet of water within the same time and with no additional cost.

However, being a manager of a plant, of course the author is concerned chiefly with the operator's side of the matter, and it is the benefits and advantages to be derived by the operator himself that it is proposed to show in making a comparison of the statistics set out below representing the operation of this plant first upon a flat-rate basis and later upon a meter basis. Of course, the points of the greatest concern to the operator are, increasing the general efficiency of his plant, cutting down the amount of water to be pumped, cutting down the amount of fuel consumed—with the consequent decrease in operating expense—and increasing the revenue.

In 1911 the plant was operating upon a flat-rate basis. The installation of meters was begun in the fall of 1913 with the idea of metering the entire system, which was practically completed in 1915. Beginning with the year 1916 the plant was operating upon practically an all-meter basis. Therefore, by a comparison of the statistics covering the operations during these two years the effect of the installation of the meter system can be shown. By this comparison the author proposes to show how the amount of water pumped per day in 1911 under the flat-rate basis was decreased in 1916 under the meter basis by about 27 per cent, notwithstanding the fact that there was an increase in the number of consumers in 1916 of about 65 per cent, and how the amount of coal consumed in 1911 was decreased by about 63 per cent in 1916, and the operating cost decreased proportionately.

The general conditions under which the plant was operated in 1911, and the equipment, were as follows:

The power plant is situated upon the banks of the Warrior River, about 3 miles above the City of Tuscaloosa. The plant is situated upon an incline, the settling basin being above the plant and the

water flowing by gravity through slow sand filters to the clear-water basin below the plant. The water was pumped from this clear-water basin to a stand-pipe in the city, the tank having a capacity of 125,000 gallons and an elevation of 100 feet. The pumps were operated 24 hours a day, working against a pressure of 165 pounds at the plant. The actual equipment consisted of three 72 inch by 16 foot return tubular boilers; two horizontal, compound, non-condensing, Worthington pumps, alternating in operation weekly. The cylinders were: high pressure, 16 inches; low-pressure, 25 inches; water plungers, 11 inches; stroke, 15 inches; rated capacity 24 gallons per stroke. The water pumped in 1911 is figured on the delivery of these pumps, allowing 10 per cent for slippage.

The figures covering the operations during the year 1911 are as follows:

Number of consumers at end of 1911:	
Flat-rate	927
Meter	42
Amount of water pumped during entire year, gallons	317,335,980
Average amount of water pumped daily, gallons	869,413
Number of tons of coal used during year, tons	3,285
Cost of coal per ton	$2.00

The general conditions under which the plant was operated in 1916, and the equipment, were as follows:

The operating conditions in 1916 were the same as in 1911, with the exception that a new reservoir had been built within one-half mile of the power plant. It is 62 feet high and 75 feet in diameter, constructed of reinforced concrete. This reservoir was planned and built by Morris Knowles, of Pittsburgh. There was also a new high service pumping engine added; type, Myer; gear flywheel; high-pressure cylinder 14 inches; low-pressure cylinder, 30 inches; water plunger, $10\frac{1}{4}$ inches; stroke, 24 inches; condensing; rated capacity, 30 gallons per stroke; manufactured by Laidlaw-Dunn-Gordon Company. The amount of water pumped in 1916 is figured on the delivery of this pump, allowing 5 per cent for slippage. The number of pumping hours was reduced in 1916 to an average of ten hours per day.

The figures covering the operations during the year 1916 are as follows:

Number of consumers at end of 1916:	
Flat-rate	190
Meter	1,414
Amount of water pumped during entire year, gallons	230,779,985
Average amount of water pumped daily, gallons	632,274
Number of tons of coal used during the year, tons	1,215
Cost of coal per ton	$1.95

Comparison of the statistics for the two years 1911 and 1916

Total number of consumers in 1911	969
Total number of consumers in 1916	1,604
Numerical increase in number of consumers	635
Representing an increase of 65 per cent plus.	
Amount of water pumped during 1911, gallons	317,335,980
Amount of water pumped during 1916, gallons	230,779,985
Numerical decrease in gallons pumped	86,555,995
Representing a decrease of 27 per cent plus.	
Number of tons of coal used during 1911	3,285
Number of tons of coal used during 1916	1,215
Numerical decrease in number of tons	2,070
Representing a decrease of 63 per cent plus.	

All the above figures are taken from the records of the City Commission of Tuscaloosa, and can be verified upon inquiry.

From the standpoint of efficiency, and in order to check the operations of the plant, it is essential that the operator account for, so far as is possible, all the water that is pumped; and it is unquestionable that the meter system provides the best method for this. However, notwithstanding all the benefits derived from the employment of meters, even where the meter system is employed certain conditions arise in which it is not practicable to use meters. It will be noted that while employing the meter system almost entirely, there are still 190 consumers receiving water on a flat rate. This condition arises from the fact that these 190 consumers live outside the sewer zone and have each only one opening on the premises, and twenty meters placed on consumers under identically the same conditions show that 50 per cent of the minimum allowed under the flat rate is never reached.

With the meter system in operation during the year 1916 it was possible to account for 85.8 per cent of all the water pumped during the year. These figures would be higher but for the fact that there

was no way of accounting for the water used in fighting fires, and the amount used in street flushing, sprinking, etc., is purely an estimate based upon the capacity of the tank, and the estimate is in fact considerably below the amount of water actually used for these purposes. The figures in substantiation of this are as follows:

	gallons
Total meter reading for domestic consumers	114,186,477
Total meter reading for manufacturers, etc	58,144,425
Total meter reading for filter wash-water	9,552,660
Total meter reading for schools	2,920,460
Estimated amount used in street sprinkling, etc	11,182,000
Total amount of water accounted for by records	196,986,022
Total amount of water pumped during year	230,779,985
Water unaccounted for	33,793,963

Representing a percentage of only 14.2 of the total amount pumped unaccounted for.